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Beekeeping in the Buckwheat Region

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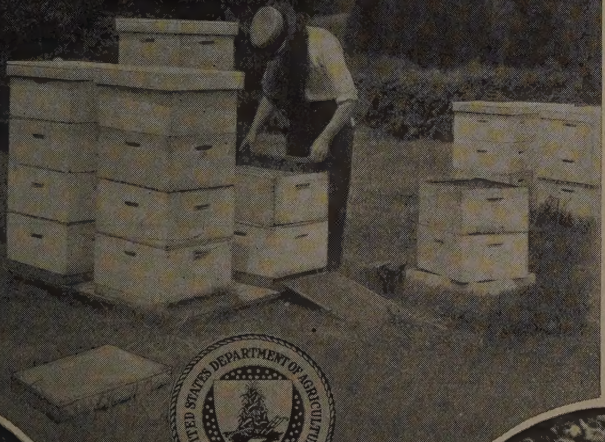

UNITED STATES DEPARTMENT OF AGRICULTURE

THE production of the full honey crop from buckwheat requires a plan of apiary management quite different from that of most other beekeeping regions. A system of management is here given which will result in a full honey crop and at the same time control European foulbrood, which is so prevalent in the buckwheat region.

Methods are also given which may be used in case the clovers are valuable as sources of nectar.

Contribution from the Bureau of Entomology
L. O. HOWARD, Chief
Washington, D. C. January, 1922

BEEKEEPING IN THE BUCKWHEAT REGION.

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THE successful production of honey from buckwheat requires special and quite different methods from those applicable to a typical clover territory, since buckwheat comes into flower long after the blooming period of white clover. Although buckwheat is now the source of a large amount of honey, estimated by Jones[1] as 2.9 per cent of the total for the United States, and although some parts of the buckwheat region are at present fully stocked with bees under good management, in other parts much nectar remains ungathered. Many beekeepers fail to take full advantage of this source of honey because of the lateness of the honey-flow and especially perhaps because of the fact that European foulbrood is endemic in this region. This bulletin undertakes to outline the methods which will enable the beekeepers of the buckwheat region to utilize fully this important source of honey. Wherever possible a single system is described rather than several methods for each phase of the work.

Buckwheat[2] belongs to the same plant family as the knotweeds or smartweeds, commonly called heartsease in beekeeping literature,

[1] JONES, S. A., 1918. Honeybees and honey production in the United States. U. S. Dept. of Agric. Bul. 685, 61 p.

[2] *Fagopyrum esculentum*, family Polygonaceae. To this species belong the three varieties commonly grown in the United States, the Japanese, the Silverhull, and the Common Gray. *Fagopyrum tataricum*, the Tartary buckwheat, is grown in a few localities in the country, to a limited extent. Of the three common varieties the Silverhull is most valuable to the beekeeper, the Japanese being commonly reported as of little value for nectar secretion. *Fagopyrum emarginatum*, the notched-seed buckwheat, is not known to be grown pure in this country.

and as the wild buckwheat which constitutes an important source of nectar in California. It is an introduced plant, probably native to China.

GEOGRAPHICAL BOUNDARIES OF THE BUCKWHEAT REGION.

The buckwheat region lies in the Northeastern States and extends into Canada. Two-thirds of the entire buckwheat acreage in the United States is in New York and Pennsylvania. Buckwheat grows westward as far as Minnesota and southward in higher elevations in the Appalachian Mountains as far as North Carolina. From the

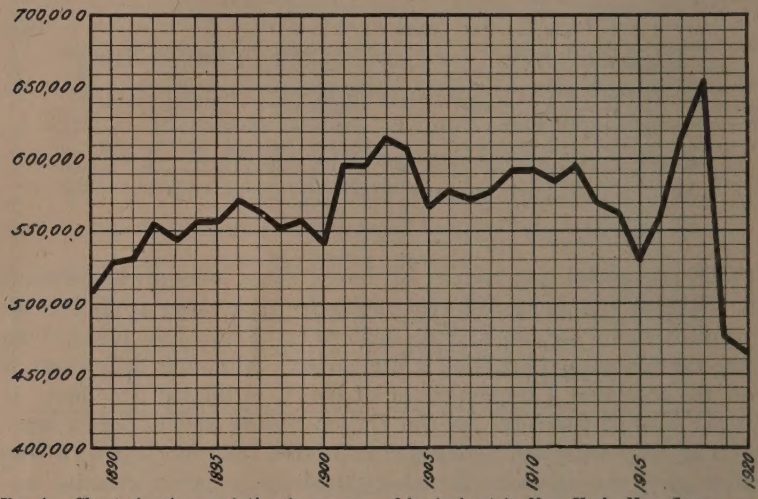

FIG. 1.—Chart showing variation in acreage of buckwheat in New York, New Jersey, and Pennsylvania. The total honey crop is closely related to the acreage. (Data supplied by Bureau of Crop Estimates.)

beekeeping standpoint the buckwheat region is limited to those places where this species is regularly grown as a farm crop in sufficient abundance to furnish nectar for a surplus honey-crop. This beekeeping region, therefore, lies in New York, Pennsylvania, northeastern Ohio, western Maryland, and West Virginia. (Fig. 1.) While this plant is grown in other States to the west of the region indicated, it is frequently a catch crop. It has little influence on the honey-crop under these circumstances and does not materially modify the plans of the beekeeper in preparing for the honey-flow. The abundance of this species in the various sections is shown on the accompanying map (fig. 2). Zavitz[3] states that the average number of

[3] ZAVITZ, C. A., 1919. Farm crops. Bul. 268, Ontario Agricultural College.

acres of buckwheat in Ontario for the past 36 years has been 118,648 per annum. In 1918 the acreage of buckwheat in the United States was 1,027,000, an increase of 27 per cent over the average for 1912–1916. In 1919 the acreage was 739,000.

VARIATIONS WITHIN THE REGION.

As indicated previously, this species is less valuable from the standpoint of nectar secretion in its western range because of less acreage. It appears also not to secrete nectar so freely when grown outside its optimum distribution, probably because of the special requirements of temperature, soil, and moisture in the abundant

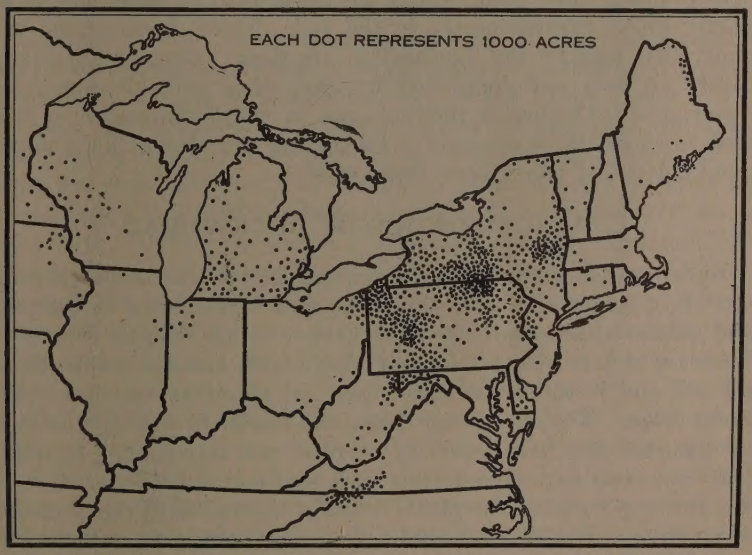

FIG. 2.—Map showing the principal buckwheat-producing region of the United States.

secretion of nectar in this species. It secretes best on the Volusia and DeKalb soils, which are formed by the disintegration of shale and sandstone, especially in the glaciated plateau region of New York and Pennsylvania. It secretes best in regions where the nights are cool and the mean temperature during the blooming period does not exceed 70° F. So far as known, the nectar is always dark in color and the resulting honey is strong in flavor. The color variation observed in the nectar of other honey plants is not observed in this species.

RELATION TO OTHER BEEKEEPING REGIONS.

The buckwheat region lies within the boundaries usually given for the clover region, but buckwheat is found most abundant in parts of the country where white and alsike clovers are less reliable sources of nectar. Beekeeping practices of the region are often materially modified by the presence of alsike clover, which grows on soils more acid than are suitable for the vigorous growth of red clover. The region extends southward into the tulip-tree region, although in the southern part of the buckwheat range the area devoted to the growth of the plant often lies too high for the best development of the tulip-tree. Where buckwheat is grown there is usually much waste land, permitting the growth of many species of plants which furnish nectar in the fall. These, however, do not materially modify the beekeeping practices. Buckwheat chiefly covers an area not dominated by any other valuable source of honey, and the region is therefore one in which the beekeeper will wish to choose those methods of beekeeping that will give the maximum amount of honey from this source.

CHARACTERISTICS OF BUCKWHEAT.

Buckwheat is a quick-growing annual herbaceous plant growing erect to a height of 2 or 3 feet. The root development is vigorous and extensive, although the roots have a rather delicate structure. They are able to utilize relatively unavailable mineral foodstuffs in the soil and in this respect the plant has an advantage over other grain crops. The stems vary from one-fourth to five-eighths inch in diameter and from green to purplish red in color while fresh. Only one stem is produced from each seed and it branches more or less freely, permitting the plants to adapt themselves to the thickness of planting. The leaves are heart-shaped and alternate on the stems, being usually sessile. The flowers are small, white to pink in color, and are borne in racemes or panicles on flower stems arising from the bases of the leaves. Flowers are produced in two forms in about equal numbers: In one form the stamens are long and the style short and in the other form the ratio is reversed. This increases the probability of cross-pollination by insect visits, and it is usually believed that insect pollination is the frequent method. Only one kind of flower is produced on an individual plant, but seeds of either form give rise to plants of both types. The ratio of these types is seemingly not influenced by differences in soil. The blooming period depends on the time of planting, the flowers first opening about five or six weeks after seeding. After blooming has once begun it usually continues until frost or harvest, although, as will be pointed

out later, the secretion of nectar is not equal throughout this period of blooming. The seeds of the common varieties are smooth and shining, with three acute angles.

Buckwheat usually grows free from the interference of weeds, as it grows too rapidly for most weeds to make headway against it. There is no serious plant disease or insect enemy of a destructive nature.

Buckwheat is less exacting as to soil requirements than other grain crops and grows on soils that fail to support the clovers and other valuable honey-plants. It is, however, exacting as to climatic conditions, requiring cool, moist weather, especially at blooming time. Since the setting of seed is dependent on proper condition of the flowers at the time of pollination, the flowering period is a critical one for the species. Buckwheat does well on thin, poor lands and on acid soils, provided the climatic conditions are favorable. As pointed out earlier, it is grown most abundantly in the United States on the Volusia and DeKalb soils of New York and Pennsylvania, which are not adapted to many other agricultural crops because of the lack of lime and general poverty of the soils. Dry soils are required for germination, and considerable heat is advantageous in the early stages of growth. During the period of blooming and seed formation high temperatures are injurious, especially when hot sunshine follows showers, causing blasting of the flowers. It is adapted especially to high altitudes and regions where the growing season is short, but any frost during the growing season will kill the plants. They can not stand a temperature of more than three or four degrees below freezing.

The secretion of nectar from buckwheat is quickly influenced by various factors. It is commonly observed that buckwheat secretes best in the early part of the day; but in some localities, especially those where the temperature is lower, secretion may continue throughout the day. Secretion is more abundant following cool nights, especially if the sun comes out bright the following day and if there is little or no wind. Secretion is reduced or stopped when the temperature drops below 70° F. While buckwheat is usually planted so that the blooming period comes in August, earlier plantings are sometimes made, especially for orchard cover crops. It is often observed that the earlier bloom is almost if not entirely devoid of nectar. The last bloom of the year, after about September 1 until frost, secretes little or not at all. The flowers are quickly blasted by unfavorable weather conditions, thus stopping nectar secretion. Leighty, in Farmers' Bulletin 1062, calls attention to the fact that "many buckwheat growers believe that the weight per bushel of the seed is heavier where the crop has been worked largely by bees." [4]

[4] For further information regarding the cultivation and uses of this species, the reader is referred to Farmers' Bulletin 1062, Buckwheat, by Clyde E. Leighty, issued in 1919.

PRESENT DEVELOPMENT OF BEEKEEPING IN THE REGION.

Beekeeping has long been extensively practiced in the buckwheat region, especially in New York, but there are vast areas in New York, Pennsylvania, and West Virginia where there is little commercial beekeeping and where there are not enough small beekeepers to utilize much of the nectar from this species. It has long been recognized that this region is especially adapted to commercial beekeeping. This is so because of the large acreage of this plant, but especially because of the widespread distribution of European foulbrood, which makes side-line beekeeping well-nigh impossible. Even in parts of the region where there was formerly an extensive development of the industry there is now great opportunity for the growth of the business of beekeeping. The presence of disease has had a serious retarding effect on honey production in this region, because of a failure even on the part of many of the better beekeepers to control it properly. Not only has European foulbrood retarded the industry but a failure on the part of the beekeepers to practice the best methods of beekeeping has resulted in a great reduction in the crop per colony. The number of colonies of bees to the square mile in this area, except in localities where the bees have been eradicated by disease and because of poor management, is almost as great as in any other part of the United States. In spite of this condition, the honey production of the region is inadequate. Especially where the honey resources are augmented by nectar from the clovers or some other plant which furnishes nectar earlier in the season than does buckwheat, there is opportunity for the development of extensive beekeeping operations. Buckwheat might easily be the source of far more honey than is now produced in this region.

PECULIARITIES OF THE REGION.

One of the difficulties in the development of the buckwheat honey region has been the lack of specific literature dealing with this important area. The practices of the clover region, which have formed so large a part of the beekeeping literature, are not suitable for the gathering of the full crop from buckwheat, although the basic principles of beekeeping practice are everywhere the same. Beekeepers who depend on sets of rules have failed to succeed in the buckwheat region when they have followed rules laid down by beekeepers operating in the clover region. This lack of specific literature concerning buckwheat as a honey-plant is a serious one, and the chief object of this bulletin is partially to make up this deficiency.

As buckwheat secretes nectar so late in the summer, the colonies of bees properly cared for reach the peak of their prosperity too long

before surplus honey is available. On the other hand, colonies that are retarded in their development early in the season, by bad wintering, by the presence of European foulbrood, or by lack of stores, may not reach complete development even in time for the late honey-flow from this source. It is therefore necessary for best results that the beekeeper of the buckwheat region practice those methods which will produce full-strength colonies early in the season to combat European foulbrood, and then that he so modify his system as to cause the colonies to have the greatest possible population of young vigorous bees at the beginning of the secretion of nectar from buckwheat. A failure to have the colonies strong and at the same time composed of young, vigorous bees at the beginning of the buckwheat honey harvest is the cause of the loss of tons of honey from this source annually.

It will thus be seen that the proper care of bees during winter is a serious problem throughout the buckwheat region; in fact, there is no place where this is more important. This has not been fully recognized, because of the lateness of the secretion period. It is also evident that after brood-rearing has begun it must progress rapidly in order that the colonies may be able to combat European foulbrood successfully, and only young, vigorous queens can lay the eggs necessary for such a development of the colony. Abundant stores are needed in the early part of the year, but beekeepers frequently neglect to provide these, although usually there are fall sources of honey which are stored in the brood-nest, making it less necessary to give additional stores in the spring than is usual for strictly clover areas. It is also unfortunately true that many of the bees of the region are of the inferior German or black variety, and this race is especially susceptible to European foulbrood. The scrub queens of this variety may begin egg-laying at a good rate, but too frequently fail before the colonies are up to full strength, thus making them still more prone to contract disease. Methods for remedying these defects will be discussed later, but it is evident that the production of a crop of honey from buckwheat requires a high degree of skill on the part of the beekeeper. The chief causes of failure in this region are, therefore, poor wintering, inferior stock, and a failure to adapt the beekeeping practices to the peculiarities of the time of blooming of this source.

TYPE OF HONEY TO BE PRODUCED.

The honey from buckwheat is darker than any other honey produced in large quantities in the United States and the flavor is strong. Such honey should never be put on the general honey markets of the country in the form of comb-honey. There is always a small local

demand for comb-honey from buckwheat, however, and where a beekeeper is sure that he is in touch with such a market, he may safely produce some comb-honey. Fortunately little bulk comb-honey (chunk honey) is produced in the buckwheat region. For the general markets, and also for general use within the buckwheat region itself, extracted honey is the only type of buckwheat honey which should be produced. Furthermore, the daily gain on colonies from buckwheat is less rapid than from many other sources of nectar, and this results in less well filled and sealed sections of comb-honey. Unfortunately most beekeepers, when taking up modern methods of beekeeping, get equipment suitable for comb-honey production. The production of extracted honey is well adapted to commercial honey production, and the characteristics of the buckwheat region make it especially desirable that beekeeping be practiced on an extensive scale. Even when clover honey is produced extensively in the buckwheat region, it is desirable that it also be extracted to avoid the necessity of two sets of equipment.

OTHER PLANTS IN THE REGION WHICH FURNISH NECTAR.

Throughout the buckwheat region many other plants add to the beekeeper's profit. Fruit bloom, dandelion, maples, and other early spring sources are useful in helping the bees to build up in the spring, but do not furnish surplus honey. White clover[5] and alsike clover,[6] which bloom in June and early July, are found in almost all parts of the region, but the soil conditions usually are not the best for the secretion of nectar from these species. Alsike clover is coming into more general use as a forage crop in this region because of its adaptability to soils that are deficient in lime and which are cold. It is more often found in the valleys with buckwheat on the adjacent hills. Basswood,[7] which blooms in the middle of July, was formerly abundant in the region, but has been largely removed. Sweet clover[8] is sometimes found blooming in July, but is rarely of much value in the region. Asters[9] and goldenrods[10] usually furnish considerable nectar in the fall. Many minor sources of nectar also occur locally, but these do not modify the beekeeping practices.

The chief modifications in beekeeping practice arise from the effort to obtain a surplus crop from the clovers. These plants furnish nectar several weeks before buckwheat blooms, and it is therefore necessary that the colonies be at full strength at this earlier date if the fullest advantage is to be taken of these sources. Since European

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[5] *Trifolium repens.*
[6] *Trifolium hybridum.*
[7] *Tilia americana.*
[8] *Melilotus alba.*
[9] *Aster* spp.
[10] *Solidago* spp.

foulbrood is found throughout the buckwheat region, however, this also necessitates the possession of strong colonies much earlier than would be necessary simply to get the buckwheat honey harvest. It therefore is unnecessary for the beekeeper to do anything other than prevent the ravages of this disease in order to get all the nectar available from the clovers. The practices herein given are such as to yield the fullest return from the clover crop.

EQUIPMENT RECOMMENDED.

The hive generally used in the buckwheat region is the 10-frame Langstroth, and all the practices described in this bulletin are based on the use of this hive, which is the standard for the United States. Hives having deeper frames or a larger brood chamber may be used without great difference in the methods here described, but no hive smaller than the 10-frame Langstroth should be used in this region. This hive is not patented and is now sold by all the dealers in beekeeping supplies. Care should be exercised to get accurately made hives and frames. The spacing of the frames should be accurate and the parts of all the hives should be interchangeable.

The combs of the brood chamber should be all of worker-sized cells. This may be obtained by the use of full sheets of comb-foundation, and no beekeeper of this region can afford to use merely starters of foundation. The frames should be carefully wired to strengthen the combs. Detailed directions for arranging the sheets of foundation in the frames and for wiring are given in Farmers' Bulletin 447 and in still greater detail in the books on beekeeping. Even when full sheets of worker foundation are used there will be a tendency for the foundation or the combs to sag, leaving several rows of imperfectly formed cells at the top of the frames. The beekeeper should constantly sort out imperfect combs and use them for the supers. Extra care should be exercised to see that only perfect combs are placed in the lower one of the two hive-bodies during the winter, in order that the queen may pass easily from the second to the first story during the period of brood-rearing previous to the time of unpacking.

Because of the presence of European foulbrood throughout the buckwheat region, no race of bees may be used with safety except the Italian. This race has the ability to clean house so well developed that the bees can clean out the remains of the larvæ dead of this disease, provided other conditions are right. Not all strains of Italian bees are equally good for this purpose, however, and the beekeeper of this region should take pains to get those which are best. No one strain can be recommended as the best, and the proper plan for the beekeeper is to buy several untested queens from several

reputable queen-breeders who have been engaged in breeding queens for sufficient time to establish their reliability and ability to breed good stock. The names of breeders may be obtained from advertisements in the bee-journals. From queens thus purchased there may be chosen the one or ones suitable for breeding purposes, and the beekeeper should then plan to raise his own queens from this stock. The time and methods of queen-rearing will be discussed on later pages.

ADAPTATIONS OF BEEKEEPING PRACTICE FOR THIS REGION.

To obtain a crop of honey from buckwheat and at the same time have the colonies in such shape that they can overcome European foulbrood during the period of its prevalence in the spring and early summer, it is of the highest importance that the beekeeper begin the work of preparation early. It will not do to wait until the buckwheat is in bloom and then make the most of what the bees are able to do. This always results in a reduction of the crop, sometimes to the point where no surplus honey is obtained. The beekeeper of this region is extremely fortunate in that the late honey-flow practically insures sufficient brood-rearing to make a winter colony.

OUTLINE OF THE ANNUAL CYCLE FOR THIS REGION.

To have a good colony of bees at the beginning of the active season it is necessary that the beekeeper begin his preparation about August 15 of the previous year. This is during the period of nectar secretion from buckwheat, and he will still have honey to remove from the hives, but from this time on he should have constantly in mind the prosperity of the colony for the coming winter period, giving them during the ensuing six or eight weeks conditions favorable for the rearing of brood for the winter colony. During the winter he should in every way conserve the energy of the bees so that they will not begin brood-rearing too early and so that they may also be able to do the work of brood-rearing to the fullest extent in the spring. During the spring they must be provided with abundant stores or brood-rearing will be curtailed at this critical time. These things will bring the colonies to full or approximately full strength at the time when alsike clover comes into bloom, enabling the beekeeper to get the available crop from this source, which has been somewhat neglected in this region. The plan from the beginning of the alsike clover bloom until the beginning of the buckwheat bloom will depend on whether the beekeeper desires to make increase in the number of his colonies before the buckwheat honey-flow. His decision in this matter will be determined by the importance of clover as a source of honey.

FALL PREPARATION.

The exact procedure in fall management will depend on the prevalence of clovers or basswood in the locality, which will in turn determine the methods of getting the bees ready for the buckwheat harvest, as outlined later in this bulletin. In any case, each colony that is to go through the winter should have, by August 15, the queen which is to head it the following spring. It should also have, regardless of the prevalence of buckwheat in any particular season, two 10-frame hive-bodies, one of which is devoted to brood-rearing and the other one well filled with honey for the use of the bees during the winter and spring. If there is in any year a failure of buckwheat and the upper hive-body is short of stores, the beekeeper should see to it that each colony has at least 20 pounds of honey at all times from August 15 to October 1 in order that the bees for the winter colony may be reared. This amount will, however, not be adequate for the winter and spring. The matter of fall and winter stores rarely needs special attention in the buckwheat region, if the beekeeper leaves enough with the bees.

WINTER CARE.

The problem of caring for bees during the winter season is the most important that the beekeeper of the buckwheat region has to face, chiefly because of the fact that European foulbrood is so prevalent throughout the region. The stores to be used during the period of confinement, whether outdoors or in a cellar, must be of good quality to reduce the danger from dysentery. These stores will be those next to the winter cluster which will be used first; and if there is any question as to the quality of the stores, the beekeeper may insure good stores by feeding at least 10 pounds of granulated sugar in the form of a thick sirup or honey of good quality from healthy colonies after all brood-rearing has ceased. (Fig. 3.) Fortunately, buckwheat honey is good for the winter period, and unless inferior honey is stored after the close of the buckwheat honey-flow the beekeeper need give no further attention to the quality of the honey.

In the colder parts of the region many beekeepers winter their bees in cellars. If this is practiced, great care must be exercised to see that the cellar is so constructed that the temperature will be maintained uniformly, not too high or too low. Detailed directions for the construction and maintenance of cellars are given in Farmers' Bulletin 1014 of the Department of Agriculture, to which the reader is referred. In a properly constructed bee-cellar (fig. 4) the ceiling and every other part of the wall surface must be below the frost line, to prevent fluctuations in temperature due to outside changes and to maintain a temperature sufficiently high to prevent the wasting of

the energy of the bees by heat generation. When colonies are wintered in cellars they will, perhaps, be kept in one hive-body, but in

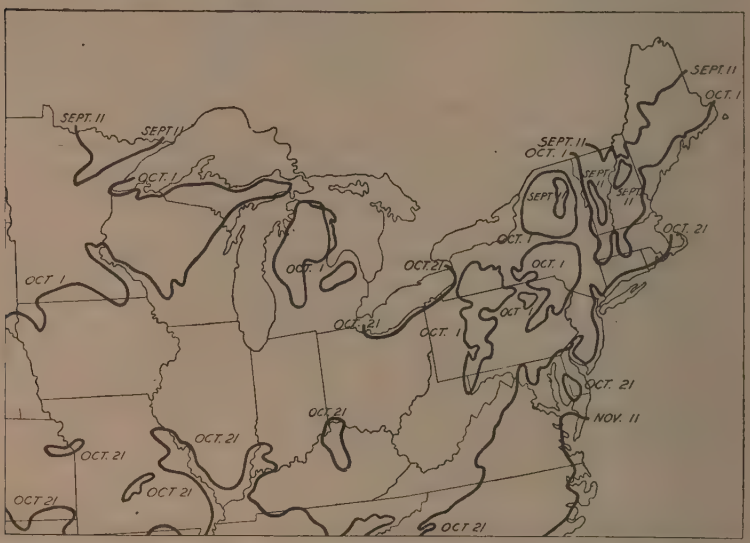

FIG. 3.—Map of buckwheat region showing average date of first killing frost in fall. From these data the beekeeper determines the time to pack colonies of bees wintered outdoors. Feeding for improvement in winter stores is done after the first killing frost.

this event it is imperative that a second hive-body well filled with honey be stored to be given to each colony during the period of heavy

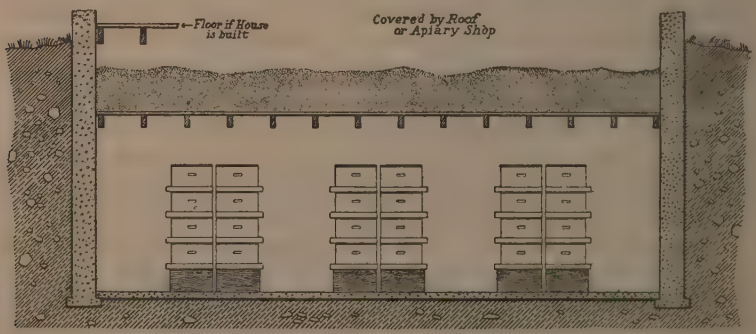

FIG. 4.—Diagram of bee cellar. Clearance 6½ feet, ceiling 2½ feet below ground level, packed with about 1½ feet of sawdust.

brood-rearing of spring. The hive-body with the bees should contain at least 25 pounds of honey. A failure to provide this extra room and stores is the cause of great loss from disease in many parts of the region. There is no better place to store the extra hive-body of

honey or any better way to winter bees in the cellar than to leave all the honey with the bees, if one can arrange to handle the heavy hives as they are put in and removed from the cellar.

For outdoor wintering, which is increasing in popularity in this region, and which is much preferable in the southern part of the region, the reader is referred for methods to Farmers' Bulletin 1012 of the Department of Agriculture. The quadruple winter packing-case (fig. 5) described in this bulletin is one of the best that can be used in the buckwheat region. Throughout the buckwheat region the bees should be packed not later than October 1 and unpacked

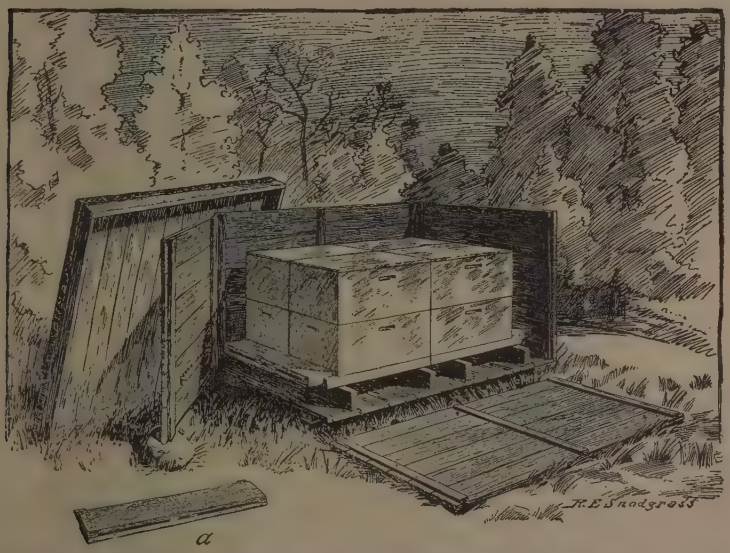

FIG. 5.—The winter packing cases used in the Bureau of Entomology apiary: *a*, Detail of tunnel to hives. In the specifications given in Farmers' Bulletin 1012 provision is made for room for a third hive-body to be added in the spring.

about May 20 to June 1. (Fig. 6.) Early packing is important in conserving the vitality of the bees that are to start the work of the colony the following spring. Throughout the buckwheat region 4 inches of packing are needed underneath the hives, 8 inches at all sides, and 12 inches on top. Dry sawdust, fine planer shavings, well dried leaves, or any other finely divided packing material may be used. It is not safe to wait until the leaves fall before packing, for this is often more than a month too late. The entrances of the hives must be reduced, as described in the bulletin on outdoor wintering above mentioned, and the hives should be protected from wind.

The bees should be wintered in two hive-bodies, just as was described for the late summer (p. 13). It is not safe in this region to

put bees into winter quarters outdoors on less than 45 pounds of stores, for while a considerable amount of nectar may come in during the early spring, occasionally this does not happen in this region, and it is necessary that the beekeeper leave the amount specified in order to insure the proper building up of the colony after March 1.

FIG. 6.—Map of buckwheat region showing average date of last killing frost in spring. From these data the beekeeper determines the time to unpack colonies of bees wintered outdoors and estimates the probable time of the beginning of nectar secretion from the clovers.

It is much safer to leave the entire amount all winter than it is to give more before the time of unpacking in May.

SPRING CARE.

If the bees have been wintered in a cellar in single hive-bodies, as is customary, they should be given the second hive-body containing the additional honey and room for brood-rearing not more than four weeks after their removal from the cellar. This should usually be given about May 1. If the lower hive-body has scant stores, the supply of honey should be given as soon as the bees are put out of the cellar. Unless the stores are needed, the cover of the hive should not be removed until the second story is added about May 1, since the bees will not be able at this time to seal the cover of the hive. Entrances to the hives should be contracted on removal from the cellar and no further spring manipulation is needed or desirable at least until May 20. In unusually favorable seasons it may be desirable to add a third hive-body to hold the honey from

fruit-bloom. If it is thought necessary to examine any of the colonies early, this should be done from below, but if the proper care has been given the beekeeper knows the condition of each colony without examination, and the bees are better off without disturbance.

If the bees were wintered in packing-cases outdoors, the packing should not be removed until this is necessary to permit some essential spring manipulation. If there is any evidence of preparation for swarming or if there is an unexpected early spring honey-flow, the bees may need either more room or some different arrangement of the parts of the hive. Ordinarily the only spring manipulation necessary up to the time of unpacking is that of enlarging the entrances to the hives as the population of the colonies seems to require.

Some beekeepers practice the clipping of the wings of their queens in the spring to prevent the swarms from leaving, and this is most easily done before the colony population is so greatly increased. If the queens are clipped, the operation should be delayed at least until the time of unpacking outdoor colonies, as the bees need the protection until the time specified. With the methods of swarm control and requeening adaptable to and desirable for the buckwheat region, the clipping of queens is superfluous.

In some seasons the bees may make preparations for swarming before the usual time for removal of the packing. If this is general throughout the apiary, the packing-cases should then be removed. If any swarms should issue before the packing is off, they should be hived on new stands, thereby increasing the number of colonies in the apiary. Within a week of the issuance of the swarm, the parent colony must be unpacked and all queencells removed except one to prevent the issuance of afterswarms. The swarm can be handled in this way, because in the buckwheat region both the swarm and the parent colony may be built up to full strength before the buckwheat honey-flow.

MODIFICATIONS OF PRACTICE BASED ON THE POSSIBILITY OF A JUNE HONEY-FLOW.

In the buckwheat region it is essential that every colony be brought practically to full strength by June 10 because of the widespread distribution of European foulbrood, even though no honey-flow is to be expected from clovers. A failure to recognize this fact fully is responsible for the terrible devastation from this disease in this region. However, if this is done the bees normally, in the absence of a clover honey-flow, come to the beginning of the buckwheat honey-flow with the colonies composed largely of old bees incapable of gathering the full crop of buckwheat honey. If there is a clover honey-flow there

will also be a tendency for the old queens to reduce the number of eggs laid daily, thus causing the colonies not to be in the best condition for the buckwheat honey-flow. In the absence of a clover honey-flow it is most desirable that these strong colonies be utilized to the fullest extent, and to this end these bees should be used to rear many times more young worker bees for the buckwheat harvest, since there is fortunately ample time for this to be done. A failure to take advantage of this possibility has greatly reduced the buckwheat honey-crop. Since it takes about six weeks for the development of a colony of young bees from each part of a divided colony, it is possible in this region to follow the plan here outlined.

After the colonies of bees have built up almost to full strength, the beekeeper of the buckwheat region is called upon to determine his future work of the year, based on the probability of getting a crop of honey from the clovers or some other honey-source blooming in June. There will be two possibilities:

(*1*) *Prospect of no surplus clover honey-flow* (a) because of a failure for the year or (b) because the clovers do not normally secrete nectar in the locality due to their absence or to the peculiarities of the soil. In this event, each colony may be divided into two or more colonies and the queenless colonies given young queens which will begin laying not later than June 15. Unless permanent increase in the number of colonies is desired, the less desirable queens are killed and the parts of the original colony are united August 15.

If there is no prospect of a surplus honey-crop from the clovers in the locations now occupied by the beekeeper, he may sometimes be able to find other locations within moving distance to which the bees may be moved to take advantage of these sources.

This migratory beekeeping has not been practiced extensively by the beekeepers of the buckwheat region, but with fuller development of the area it is to be expected that this practice will increase, as it already has in other parts of the country. The presence of European foulbrood has been considered a drawback to this practice, but if the proper methods are used this may be entirely disregarded. In fact there is no better way to overcome this disease than to move to places where the bees may take advantage of an early honey-flow. This is the practice of many beekeepers of the European foulbrood regions of California.

(*2*) *Prospect of surplus honey-flow from clovers*, perhaps augmented by basswood in July. No increase should be made in June. Each colony should be requeened in connection with swarm control, but this should be done for every colony not later than June 15, so that the young queens will begin laying not later than June 25. If permanent increase is needed, this should be made by devoting cer-

tain colonies to this use after the close of the clover honey-flow at the sacrifice of the buckwheat honey-crop.

DIVIDING THE COLONIES IN JUNE.

By June each colony should have brood in two hive-bodies. It is understood that if this plan is followed the division is to be made before the normal time for the bees to swarm, thus controlling this instinct. About June 1 place the old queen in the lower hive-body with a small amount of brood, most of the brood being placed in the upper hive-body if necessary and a queen-excluder placed between the two hive-bodies. In 10 days all the brood in the upper hive-body will be sealed. At this time (June 10) remove the upper hive-body, give it a bottom board, and cover and place it beside the original colony. At this operation give the removed queenless portion a ripe queencell or virgin queen (or, if available, a young laying queen). If a young laying queen is given, the division may be made 10 days later. The young queens should, as previously stated, be laying by about June 15 to 20 in order that there may be adequate time for the development of the new colony to full strength for the buckwheat honey-flow. As the beekeeper increases in skill in wintering his colonies, he will find that the colonies are sufficiently strong so that it will be possible for him to increase each colony to three colonies and still have them sufficiently strong so that each portion may be ready for the buckwheat honey-flow, but great care should be exercised in this regard. Whatever plan is followed, the beekeeper should constantly keep in mind the fact that the object of this division is to have the maximum number of eggs laid between June 15 to 20 and the beginning of the buckwheat honey-flow.

For the proper development of the several parts of the original colony it is necessary that each part have never less than 15 pounds of honey (the equivalent of three full frames) at any time previous to the beginning of the buckwheat honey-flow. The amount which must be left with each portion at the time of division will be determined by the amount available in the field at that time. If honey in combs is not available, and if there is a scarcity of nectar from the fields, it will be necessary to feed each colony. If feeding is practiced, it is dangerous to depend on daily feeding unless more is given each day than is consumed by the bees. The better plan is to feed in large quantities at each feeding, bearing in mind at all times the necessity of keeping the requisite 15 pounds of stores in the hives every minute during this interval.

Each colony will need at least two hive-bodies for full development of the requisite brood at least by July 10. If the additional room is not given, it will be impossible to have full-strength colonies at the

beginning of the buckwheat honey-flow, for there is not room in a single 10-frame Langstroth hive to provide for the adequate development of the colony population and at the same time leave with the bees the requisite stores for full brood-rearing.

SUPPLYING YOUNG QUEENS.

It is impossible in the space of this bulletin to give full directions for queen-rearing, but these directions are given in the various books on beekeeping, to which the reader must be referred. The beekeeper in the buckwheat region can not well afford to depend on the purchase of queens from queen-breeders for requeening all of his colonies, nor can he get the full honey-crop unless he requeens his colonies from good Italian stock reared in his own apiaries every year. Even though it were possible, the beekeeper could not afford to requeen before June 1, for that would interfere with the rearing of the large amount of brood necessary for combating European foulbrood. He must also not interrupt the rearing of brood after August 15, as this would interfere with the development of the winter colony. He is therefore limited to the period between June 1 and August 15, and will choose the particular time during this period when the stoppage of egg-laying will interfere the least with the development of the full colony for the buckwheat harvest. As has been stated previously, to accomplish this the young queens should be laying by June 15 to 20, and this determines the time when the colonies should be requeened.

To have these queens on hand at the proper time for dividing the colonies as described, the most economical method is to rear a large number of queencells and to introduce these just before emergence, thus utilizing the colonies for mating purposes instead of making many nuclei for this purpose. It will be desirable to make enough nuclei to replace those queens which are lost during mating (about 20 per cent). The number lost may be reduced by a proper arrangement of the apiary to avoid confusion of the returning young queens after their mating flights. These nuclei may be united with the colonies whose queens fail to mate, their queens thus being given them at the same time.

UNITING PORTIONS OF ORIGINAL COLONIES.

If permanent increase in the number of colonies is not desired, the expense of rearing the winter bees in half the colonies may be saved by uniting the portions of the original colonies now placed on adjacent stands by the system here outlined. About August 15 (eight weeks before brood-rearing ceases), place the supers of the colony having the old queen on top of the one on the adjacent hive (having

a young queen). Now kill the old queen and set the hive-bodies containing her brood as supers on top of the supers of the adjacent hive. This uniting should be done when nectar is coming in freely. If at any time of the day there is a tendency for nectar-secretion of the buckwheat to slow down, as is often reported, it may be necessary to unite the upper brood-nest by placing it above two thicknesses of newspaper in which small perforations are made. The enormous colony of bees thus formed will be able to get the maximum crop from the buckwheat and swarming will rarely, if ever, result at this season.

It will often be found unnecessary to kill the old queen, since in most cases the young queen is the one which will survive. At the first manipulation of the colony after the uniting is done, the upper brood-chamber should be placed directly above that containing the young queen, thus giving the colony its two hive-bodies and old brood-combs for the winter and spring in adjacent positions. The upper of the two brood-chambers will be filled with good stores as the brood emerges. The queen-excluder should be left in position until the close of the buckwheat honey-flow. If there is drone brood in the upper brood-chamber, a small opening may be left above the queen-excluder from which the adult drones may leave this hive-body.

SWARM CONTROL WITHOUT DIVISION.

If the colonies are not to be divided, because of the possibility of getting a crop from the clovers, it will then be necessary to apply swarm-control measures. To induce the colonies to continue intensive brood-rearing, to keep them working vigorously in the supers, and at the same time to control swarming and prevent a division of the working force during the clover honey-flow, the following plan (fig. 7) may be used:

(1) About June 1, or before the clover honey-flow has begun, give each colony an extracting super on top of the second story of the hive, giving the queens full range of all three hive-bodies (fig. 7, B).

(2) By about June 10, if the colonies are strong, the queen will have abandoned the lower hive-body. Between June 10 and 15, depending on the progress of the clover honey-flow and on the development of the swarming instinct, find the queen and place her in the lower hive-body, over which is then placed a queen-excluder (fig. 7, C). The hive-body containing the most brood is now put on top, supers being added as needed between the queen-excluder and the top brood-chamber.

(3) About June 15 place in each of the top hive-bodies containing brood a ripe queencell, arranging for a small opening through which the young queens may fly out to mate.

(4) Make nuclei equal in number to 20 per cent of the total number of colonies in the apiaries in which young queens are to be mated, to provide for cases in which the queens in the upper hive-bodies fail to begin laying. If these are needed, they may be united with the strong colonies by the newspaper plan (p. 21), and these young queens thus introduced.

(5) Two weeks or more after these queencells have been introduced (after June 25) examine the combs of the top hive-body for eggs laid by the young queen. At any time toward the close of the clover honey-flow when convenient, provided the young queen has

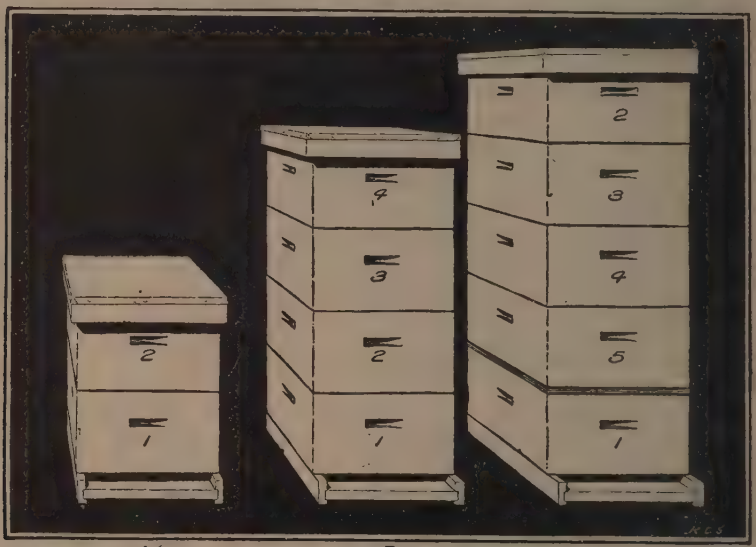

FIG. 7.—Creating conditions comparable to a swarm. Plan 2 for extracted honey. *A*, Brood in both hive bodies in the spring. *B*, Supers 3 and 4 are added as more room is needed, queen usually abandoning lower brood-chamber (*1*). *C*, Queen placed below excluder in lower hive body (*1*) after all brood in this chamber has been sealed. Empty super (*5*) is added and brood (*2*) is placed on top.

begun egg-laying, place the hive-body in which she is located on the bottom-board, cover it with a queen-excluder, and place the hive-body containing the old queen at the top (above the supers). When the clover honey is being extracted, place the hive-body containing the old queen directly above the queen-excluder. If deemed best the old queen may now be killed, but this is unnecessary in most cases as she will be killed by the worker bees after the close of the honey-flow from clover. Supers will, of course, be added as needed.

INCREASE AFTER THE CLOVER HONEY-FLOW.

If the clover honey-flow is abundant, permanent increase will usually be made at the close of the clover honey-flow and at the

expense of the buckwheat honey-crop, because of the superior qualities of clover honey.

(*a*) *When outapiaries are maintained.*—At the time increase is made, divide the colonies into two or three parts, according to their strength, leave the ones with queens on the old stands, and move the other parts to outapiaries, thus preventing the return of the field bees to the original stands. Then provide each queenless portion with a ripe queencell. This should be done in time so that the young queens will begin to lay not later than August 15, in order to provide the requisite bees for the winter colony (see p. 13).

(*b*) *Where outapiaries are not maintained.*—After supers containing the clover honey are removed, the colonies should be in two hive-bodies. On or before August 1 take away the hive-body containing the queen and most of the brood to a new stand and close the entrance with fresh grass, which will retard the return of the bees to the former location. The grass will dry out and release the bees for flight within a few hours and it is unnecessary to do anything further with this colony for the present. Leave some brood in the hive-body on the old stand (at least one frame) and provide this portion of the original colony with a queencell from which the queen is almost ready to emerge. About August 10 to 14 examine the colony on the old stand to see if the young queen is laying. If she has failed to mate, provide this colony with a queen mated in a nucleus, as described above. The buckwheat honey-flow will provide conditions for the rapid development of both colonies, and each must be given a second hive-body for the storing of the honey for winter and spring use. Sometimes a little surplus may be obtained from these colonies, but care must be exercised to see that they have the requisite amount for their own use (see p. 16).

EXTRACTING

The outfit needed for extracting and the methods to be employed will depend on the size of the apiaries maintained. Special attention should be called to the necessity of having abundant supers so that the honey may be well ripened before extraction. A failure to provide these is at present responsible for the marketing of much poor-quality buckwheat honey. While efficiency in methods of extracting is important in enabling the beekeeper to maintain a large number of colonies, this phase of the work has been so fully discussed in the books devoted to beekeeping that it does not seem best to attempt to include it in the present bulletin. This plan is adopted because this part of the work is the same in the buckwheat region as in other beekeeping regions, and especially because it is far more important to produce honey to extract.

DISEASE CONTROL.

It is unfortunately true that both of the brood diseases of bees, American foulbrood and European foulbrood, are widely distributed throughout the buckwheat region, and the beekeeper must so plan his work as to have the control of these diseases constantly in mind. There is no hope of the eradication of these diseases from the region.

European foulbrood is a disease of weak colonies of bees, and is prevalent in the spring and early summer, especially in colonies of black bees. If the practices of beekeeping herein given are followed carefully, the beekeeper will find that this disease will not cause him any anxiety. In case the disease persists in the apiary, this is conclusive proof that the beekeeping methods followed are not such as to get the maximum honey-crop. For remedial measures in getting the disease under control the reader is referred to Farmers' Bulletin 975 of the Department of Agriculture. The reasons for the development of the colony strength in the spring as a preventive of this disease have already been pointed out.

American foulbrood can not, unfortunately, be prevented by the development of the colony strength, and the shaking treatment is necessary if this disease appears. This treatment is described fully in Farmers' Bulletin 1084 of the Department of Agriculture, to which the reader is referred. If this disease is found to be bad early in the season, the treatment should be given preferably during June, in order to permit the colony to build up for the buckwheat harvest. If not enough honey is coming in at this time, the treated colonies may be given combs of honey from healthy colonies not earlier than four days after treatment, or they may be given sugar sirup if starvation is imminent. If a mild case is discovered early in the season, and if there is no clover honey-flow, it may be best to wait for treatment until the buckwheat honey-flow, but precautions must be taken to prevent the robbing out of such colonies. Treatment for this disease should, if possible, be given only during a good honey-flow.

While with the beekeeping practices herein outlined European foulbrood will constitute only a minor trouble of the apiary, it is essential that the beekeeper keep a constant watch for American foulbrood and treat every case as soon as practicable after its discovery. In localities where this disease is present he should inspect the brood-nests of every colony at least once a year, in connection with some other manipulation of the colony. This should, if possible, be done about June 1. No colony should ever be packed for outdoor wintering in which this disease is known to be present. If discovered late in the season the fall treatment described in Farmers' Bulletin 1084 may be used.

MARKET FACILITIES AND METHODS OF MARKETING.

The channels through which buckwheat honey may be sold are less numerous than for lighter honeys. There is usually a demand for this honey from the baking trade for the manufacture of cakes with rather strong flavor, such as spice cakes, and there is also a considerable market for it in large cities among the foreign population. As has been mentioned, many persons living in the buckwheat region prefer this honey to that from other honey-plants. Since the buckwheat region is densely populated, this offers opportunity for the development of a good local trade, and it is desirable that as much of the crop be sold locally as possible. In case the producer of buckwheat honey can not sell all his honey locally, he should avoid selling it in the general markets in competition with light table-honeys. At the present time the market for which there is the best demand for buckwheat honey is New York City, and the producer with commercial lots of this honey should get in touch with wholesale dealers of honey in this city. The names and addresses of such dealers may usually be obtained from advertisements in the bee-journals or by correspondence with the Bureau of Markets and Crop Estimates of the Department of Agriculture. It must be expected that the price obtained in wholesale shipments will be considerably less than for local sales, and every effort should be made by the producer to keep this honey away from the wholesale markets where it enters into competition with lighter honeys.

Extracted honey is usually sold in the wholesale markets in 5-gallon square tins, but for buckwheat honey there is a considerable demand for kegs of about 180 pounds' capacity. For local trade this honey may be put in cans of smaller capacity, such as 2½, 5, and 10 pound sizes, glass being less useful for this honey than for the lighter grades.

Buckwheat honey may also be sold by parcels post through the development of a mail-order business, by means of advertisements in daily or weekly papers, but it will be well to choose as advertising media papers which have a circulation within the buckwheat region, for purchasers outside that region will probably not care for honey of this flavor. For parcels post shipments half-gallon and gallon cans have been developed and are advertised in the bee-journals and are usually for sale by dealers in beekeepers' supplies. In the development of a local or mail-order trade, the beekeeper should take pains to obtain a distinctive label, and for buckwheat honey this label should set forth the merits of this particular type of honey rather than extoll the use of honey in general. All advertisements and labels should state clearly that buckwheat honey has a distinctive flavor, so that the purchaser will have no reason to complain if he is unaccustomed to honey with such a strong flavor.

OPPORTUNITIES FOR DEVELOPMENT OF THIS REGION.

There are vast areas of the buckwheat region of the United States that are undeveloped or only partially developed in their honey resources. This is largely due to the widespread distribution of European foulbrood, but it is also doubtless due in part to a lack of information as to the right methods to be used in obtaining the crop. Although the honey from buckwheat is inferior to that from many other honey sources, there is a real need for all of it that can be produced, and there is especially an opportunity for the development of commercial beekeeping in this region. All the factors mentioned concerning this region point to the fact that this is not one in which it is desirable that bees be kept in small apiaries, for it requires great skill on the part of the beekeeper to make the most of the resources of this area.

Only by the education of the commercial beekeepers of the region in the best methods of beekeeping practices or by the taking up of the territory by thoroughly trained beekeepers from other sections will it be possible to develop this region completely. In order that the vast areas of buckwheat may be more thoroughly occupied, it is desirable that the commercial beekeepers of the region expand their businesses by the establishment of more outapiaries. This, together with a more thorough study of the special practices necessary for the region, will result in a great impetus to beekeeping and thus serve to save for human use the great stores of nectar now so largely wasted.

Since it is impossible in the scope of one bulletin to give all the details of beekeeping practice which will be needed by the commercial beekeepers of the buckwheat region, it is necessary to refer to certain other bulletins of the Department of Agriculture in which these practices are given in greater detail. Some of these bulletins have already been mentioned. Those of the greatest interest are:

Bees. (Farmers' Bulletin 447.)
Honey and its Uses in the Home. (Farmers' Bulletin 653.)
Transferring Bees to Modern Hives. (Farmers' Bulletin 961.)
Control of European Foulbrood. (Farmers' Bulletin 975.)
Preparation of Bees for Outdoor Wintering. (Farmers' Bulletin 1012.)
Wintering Bees in Cellars. (Farmers' Bulletin 1014.)
Control of American Foulbrood. (Farmers' Bulletin 1084.)
Swarm Control. (Farmers' Bulletin 1198.)

Semimonthly market news reports of commercial honey transactions may be had free on request to the Chief, Bureau of Markets and Crop Estimates, Department of Agriculture, Washington, D. C.

HOW TO DO IT.

DO YOU WANT practical suggestions on how to build a silo, a hog house, a poultry house, a potato-storage house, or how to make a fireless cooker or other farm-home convenience? Are you seeking ideas on how to prepare vegetables for the table, how to care for food in the home, how to bake bread and cake and other appetizing foods in an efficient and economical manner? Is there some practical question about your corn or wheat or cotton or other crops, or about your poultry or live stock, to which you are seeking an answer? The answers to thousands of such questions and practical suggestions for doing thousands of things about the farm and home are contained in over 500 Farmers' Bulletins, which can be obtained upon application to the Division of Publications, United States Department of Agriculture, Washington, D. C.

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